# OpenUpScience

Issue 34

Welcome to **OpenUpScience**, the magazine from **Cambridge Science Centre**.

In this issue, we're thinking about Machines.

Find out more with the fun activities and puzzles inside!

**Machines Issue**

Use a simple machine to give you super strong fingers!

Make a banister pulley

Pull out machine booklet inside



# Welcome to OpenUpScience

from Cambridge Science Centre.

This issue is all about machines. From skateboards to door stops – machines are everywhere!

**All machines are tools to make things easier. A simple machine is a simple tool that changes the direction and size of a force to make a job easier**. There are 6 types of simple machine.


**Learn about these 6 simple machines inside with experiments and activities, then use your simple machines to make one big complex Rube Goldberg machine!**

Inside this issue is a pull out booklet to help you remember the 6 kinds of simple machines!

**What you'll need**

- This magazine!

**What to do**

1. Once you've finished reading this magazine, rip out the middle pages so you have an A4 page.
2. Fold the A4 page horizontally in half.
3. Make a fold along the other lines forward and backwards so you have a zig zag book.
4. Colour in the pictures and find examples for each simple machine around your house.

## Spark, Ignite, Fuel, Illuminate

# Banister Pulley

Try lifting the heavy load, then try with a pulley

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**What you'll need**

- A very long string
- A railing or banister
- A bag or bucket
- Some heavy objects

**What to do**

1. Take your bag or bucket and put the heavy objects inside.
2. Tie one end of the string around the handle of your bag or bucket.
3. Try to lift the objects straight up with the string. Is it hard or easy to lift?
4. Now take the other end of the long string and loop it around a strong railing or banister.
5. Pull down on the loose end of the string to pull your bucket or bag up. How does it feel to lift now?

**What is happening?!**

All simple machines change the direction of a force. Instead of pulling the heavy objects up, you can attach the bag or bucket to the string and banister above you and pull down to move it up. This means you can put your body weight into it so you should find it easier. Adding more pulleys will make heavy things even easier to lift.





# Recycled Car Toy

Make a rolling car, with a body, wheels and axles from recycled materials.

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**What you'll need**

- An empty loo roll tube
- A hole punch
- 4 milk bottle tops
- A straw
- A pin
- 2 cocktail sticks
- Scissors
- A helpful adult

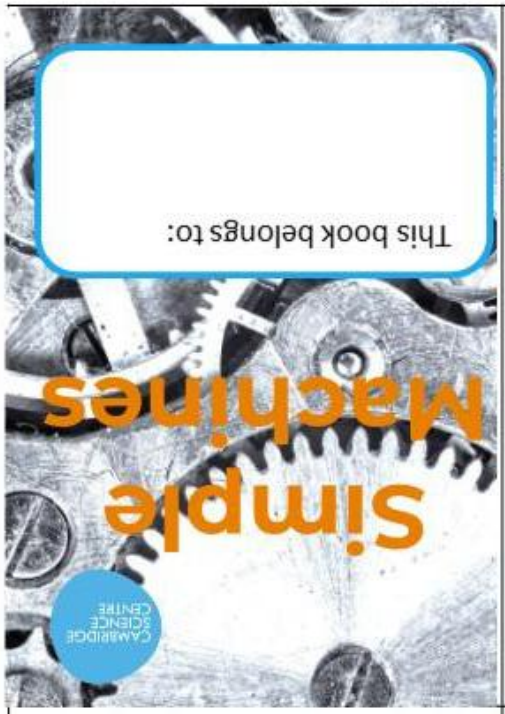


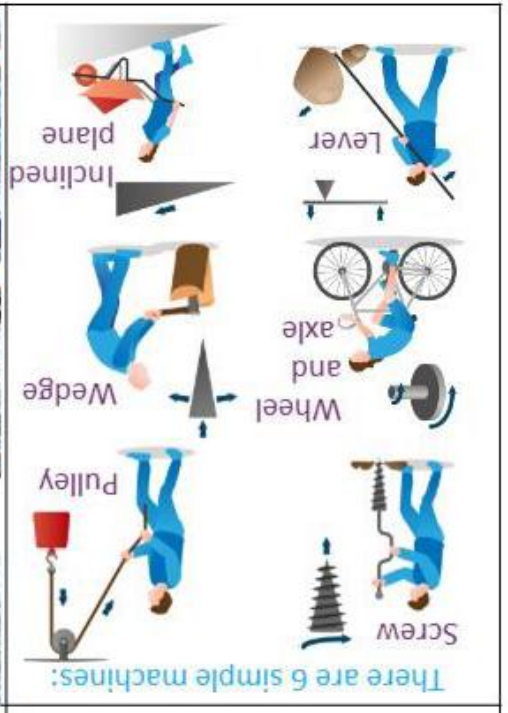

**What to do**

1. Use the hole punch to punch 4 holes - two holes at each end of the loo roll opposite each other and slightly below the middle (as shown in the picture below) to hold the axles.
2. Cut the straw into two 5cm long bits.
3. Thread one cocktail stick into each straw. Put the straws and cocktail sticks (the axles) through the punched holes at each end of the loo roll.
4. With help from an adult, use the pin to make a hole in the centre of each milk bottle top (the wheels).
5. Push the ends of the cocktail sticks into the hole in the bottle tops so that the wheels are attached to the car (shown below).
6. Have fun testing out your homemade car!

**Have a think...**

Why do we attach the wheels to the toothpicks and not the straws?




# Inclined plane

A flat surface with one end higher than the other.

Example _____



# Screw

A machine used to lift things, lower things and to keep things together.

Example _____



# Picture Puzzle Palette

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Match the description to one of the 6 simple machines and fill in the correct numbers in the circles.

**Inclined Plane**
Number: ____

**Lever**
Number: ____

**Wedge**
Number: ____

**Screw**
Number: ____

**Pulley**
Number: ____

**Wheel and Axle**
Number: ____

**1.** A sailing boat uses these to help move its sails up and down.

**2.** A slide is an example of one of these.

**3.** A triangular shaped object that can be used to keep a door open.

**4.** A seesaw is an example of one of these.

**5.** The pair that allows cars, bikes and skateboards to roll along.

**6.** To take a lid off a jar, you must keep turning this.

**Solution on the back page**

# Picture Puzzle

Colour by numbers to reveal the picture! Using the previous page, colour the boxes in the colour of the circle that contains the number in the box.

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
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| 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 5 | 5 | 5 | 5 | 5 | 2 | 2 | 1 | 1 | 1 |
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| 1 | 1 | 4 | 4 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 5 | 5 | 1 | 1 | 1 | 1 |
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| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |



Solution on the back page

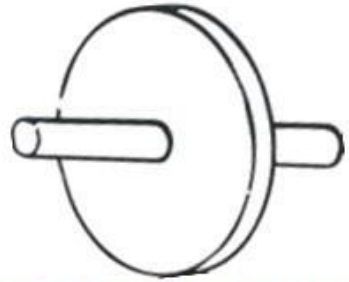


## Pulley

A rope or chain with a wheel and axle attached.

Example _____

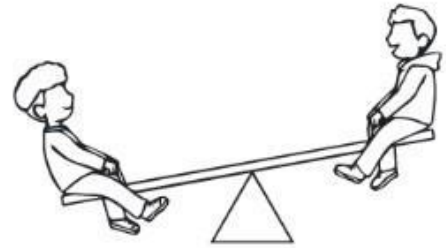
## Wheel and Axle



A wheel with a bar that allows it to turn.

Example _____

## Lever



A bar used for raising weights around a point.

Example _____

## Wedge

An inclined plane that goes to a point on one end, mostly used to separate things.

Example _____

# Super strong fingers

Use a simple lever to give your fingers super strength!

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**What you'll need**

- A firm ruler (or another long, firm, flat object)
- A pen or pencil
- A stack of books

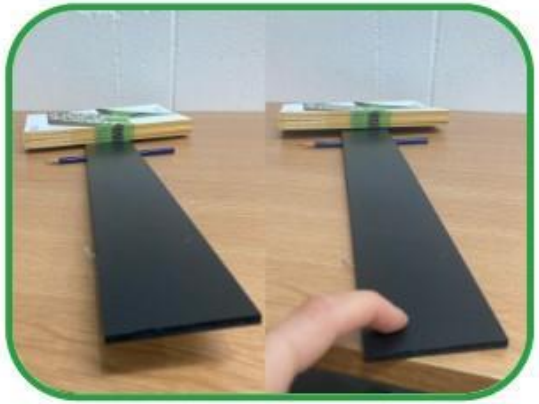
*Have a go at putting the pencil in the middle of the ruler. Next try putting the pencil only 5cm away from your end of the ruler. What do you notice?*

**What to do**

1. See if you can lift up the stack of books 2cm. Next see if you can lift up the stack of books 2cm with just two fingers.
2. Slide about 5 cm of the ruler under the books.
3. Slide a pencil under the ruler at a right angle, close to the stack of books but not under them.
4. Get someone to hold the pencil in place and push down on the ruler to lift the books 2cm. Try with just two fingers.

**What is happening?!**

When you push down on one end of the ruler, the pencil makes the other end go up – just like a seesaw. The closer the pencil is to the books, the easier it is to lift it. This means that if you put the pivot (in this case, the pencil) in just the right place, you can lift something really heavy just using your fingers!







# Rube Goldberg Complex Machine

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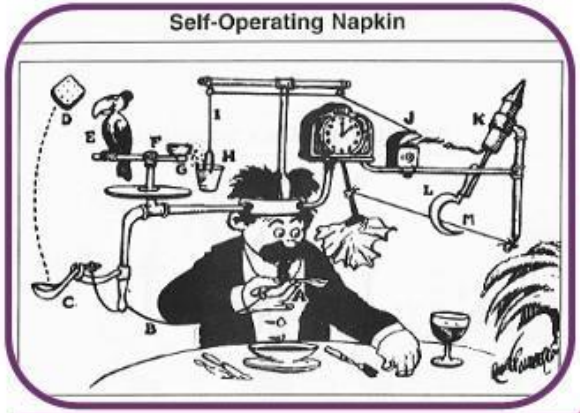
A complex machine is one that uses more than one simple machine to make something happen. A Rube Goldberg machine is a collection of lots of simple machines that each play a part in completing a simple task, like getting a ball from one end of a room to another.




**What you'll need**

- Slopes
- Dominoes
- Your recycled car toy or a ball
- A banister pulley
- Anything else you can think of!

**What to do**

1. Use the simple machines you've made in this issue and anything else you can find to create a Rube Goldberg machine to get your recycled car toy or a ball from one side of a room to another. Don't worry if it gets stuck – you can always use a 'magic finger' to give it a little nudge!
2. Send a video of your machine to openupscience@cambridgescience centre.org

Scan this QR code for inspiration and to see our massive Rube Goldberg machine!

# Puzzle solutions

**Pulley -** A sailing boat uses these to help move it's sails up and down.

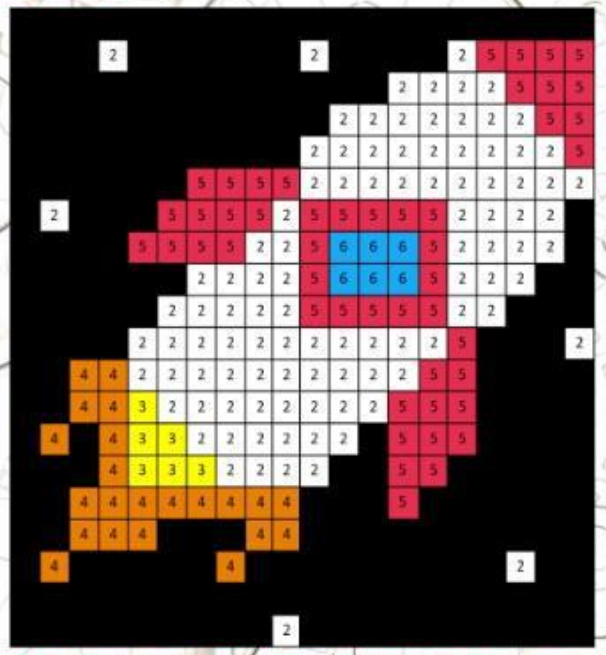
**Lever -** A seesaw is an example of one of these.

**Screw -** To take a lid off a jar, you must keep turning this.

**Wheel and axle -** The pair that allows cars, bikes and skateboards to roll along.

**Wedge -** A triangular shaped object that can be used to keep a door open.

**Inclined plane -** A slide is an example of one of these.



**Why was the sewing machine so funny?**

**It kept everyone in stitches!**





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# Spark, Ignite, Fuel, Illuminate

**Tell us what you think!**
We always want to improve, so let us know what you liked – or didn't like – about this issue!

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Email us your pictures and questions

Find out what else we're up to:

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**Cambridge Science Centre** is all about empowering children and young people to discover science for themselves through hands-on activities. While the centre isn't open as normal at the moment, we are happy to say that we are starting to run some bookable sessions!
Check out our website for more Information.

Scan here!

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